



# United States Department of the Interior

## U.S. GEOLOGICAL SURVEY

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### Description of U.S. Seismic Design Maps Web Application

URL: <http://earthquake.usgs.gov/designmaps/usapp>  
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As of December of 2009, this web application outputs earthquake ground motion parameters for designing structures in accordance with the 2009 *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures*, FEMA P-750 ("2009 *NEHRP Provisions*"). Other related documents (e.g., the 2010 *ASCE-7 Standard* and the 2012 *International Building Code*) and previous editions of the *NEHRP Provisions* will be added in the future; until then, users seeking the previous editions are directed to the predecessor of this web application, namely the Java Ground Motion Parameter Calculator also accessible from <http://earthquake.usgs.gov/designmaps>.

**Important Note:** The seismic design parameters of the 2009 *NEHRP Provisions*, the 2010 *ASCE-7 Standard*, and the 2012 *International Building Code* will be identical. However, the underlying uniform-hazard, risk coefficient, and deterministic parameters are enumerated in the 2009 *NEHRP Provisions* only (with the exception of the risk coefficients provided in the site-specific ground motion procedures of the 2010 *ASCE-7 Standard*).

The input required of the user is a site location (address or latitude and longitude) and its soil classification (e.g., Site Class C for "very dense and soft rock"). The web application displays the location on a Google Map so the user can visually check it. Site-specific soil classification is not available from the USGS. Note that multiple sites can be batch-processed by the web application.

The basis of the *design* parameters outputted is (i) *hazard* parameters computed by the USGS on a national scale, e.g., those provided at <http://earthquake.usgs.gov/hazmaps>, and (ii) site-specific ground motion procedures for seismic design stipulated in Chapter 21 of the 2009 *NEHRP Provisions* and 2010 *ASCE-7 Standard*. From both (i) and (ii), the USGS has collaborated with developers of the documents (e.g., the Building Seismic Safety Council funded by the Federal Emergency Management Agency) to derive national maps of design parameters for Site Class B. For the other site classes that may be specified by a user (i.e., A, C, D, and E), the web application adjusts these design parameters using the so-called *NEHRP* site coefficients.

**Important Note:** While based on the 2008 hazard parameters from the USGS National Seismic Hazard Mapping Project, namely probabilistic seismic hazard curves/maps and deterministic median ground motions, the design ground motions provided by this web application are different than the USGS hazard maps. This is because (i) the design values are the lesser of probabilistic and deterministic ground motion parameters, (ii) the probabilistic values are risk-targeted rather than uniform-hazard ground motions, and (iii) both the probabilistic and deterministic values are defined in terms of maximum-direction rather than geometric-mean horizontal spectral response acceleration. For more information, users are referred to the commentaries of the building code reference documents and, currently, the following publications:

- Huang, Y.-N., A.S. Whittaker & N. Luco (2008), "Maximum Spectral Demands in the Near-Fault Region," *Earthquake Spectra*, Vol. 24, No. 1, pp. 319-341.
- Luco, N., B.R. Ellingwood, R.O. Hamburger, J.D. Hooper, J.K. Kimball & C.A. Kircher, "Risk-Targeted versus Current Seismic Design Maps for the Conterminous United States," *Proceedings of the 2007 Structural Engineers Association of California Convention, Lake Tahoe, CA*, pp. 163-175.
- Petersen, M.D., A.D. Frankel, S.C. Harmsen, C.S. Mueller, K.M. Haller, R.L. Wheeler, R.L. Wesson, Y. Zeng, O.S. Boyd, D.M. Perkins, N. Luco, E.H. Field, C.J. Wills, & K.S. Rukstales (2008), "Documentation for the 2008 Update of the United States National Seismic Hazard Maps," *U.S. Geological Survey Open-File Report 2008-1128*, 61 p.